

# NASA TECH BRIEF

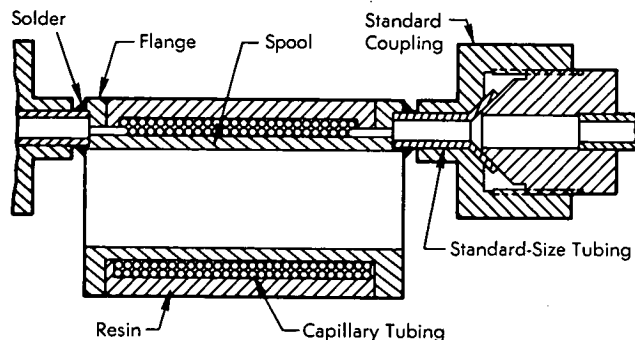
## NASA Pasadena Office



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

### Gas-Flow Restrictor

A gas-flow restrictor consisting essentially of a pre-determined length and size of capillary tubing is often used to control the flow rate of carrier gas into a gas chromatograph or the flow rate of sample gas



into a mass spectrometer inlet system. The length and inner diameter of the capillary tubing can be estimated with the aid of available mathematical expressions for viscous flow.

When a gas chromatograph is to be coupled to a mass spectrometer, it is advantageous to have at hand a wide variety of flow restrictors so that the effect of carrier-gas flow rate on the performance of the instrument combination can be studied. Ideally, a number of capillary-tube restrictors wound on spools could be conveniently stored in a box, and any restrictor then could be readily inserted into the carrier-gas inlet system of the gas chromatograph; the diagram indicates the design of a capillary-tube-restrictor spool which has been found satisfactory. The tubing is wound around a metal spool, and one end of the tubing (gas flow inlet) is inserted snugly into a small hole drilled in a flange of the spool. A recess is formed on the outer edge of the flange, substantially axial to

the small hole, and a short length of a standard-size tubing with a connector is inserted into the recess and sealed by solder or other means. The outlet for the gas flow is similarly formed and sealed at the opposing flange of the spool. The capillary-tube winding is filled and coated with an epoxy resin or other suitable material to provide thermal insulation because the rate of gas flow through capillary tubing is dependent on temperature.

The device may also include separate windings of different sizes of capillary tubing on the same spool, each with its own inlet and outlet so that a variety of flow rates are available from one spool.

#### Note:

The device is not necessarily limited to gas flow, but may be useful as well in hydraulic or fluid flow applications.

#### Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,493,012). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

NASA Patent Counsel  
Mail Code 1  
NASA Pasadena Office  
4800 Oak Grove Drive  
Pasadena, California 91103

Source: Gilbert J. Bastien of  
Caltech/JPL  
under contract to  
NASA Pasadena Office  
(NPO-10117)

Category 03